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SPECIAL CONDITIONS OF CONTRACT

1. GENERAL

- 1.1. Special conditions of contract shall be read in conjunction with the General Conditions of Contract, Specifications of work, drawings and any other documents forming part of this contract wherever the context so requires.
- 1.2. Notwithstanding the sub-division of the documents into these separate sections and volumes every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the contract so far as it may be practicable to do so. Notwithstanding anything contained in this Clause, wherever any such part/ section is declared under any statutory law or by a court of competent jurisdiction to be against the provisions of any applicable law, such part/section shall be deemed to be separate from the rest/ other parts/ sections of the Contract and the rest/other part of the Contract shall continue to exist while the part/section so declared to be invalid, shall be construed to be non-existent in the Contract.
- 1.3. The special conditions of contract shall over-ride the provisions of the general conditions of the contract, if and only, if the terms contained in the general conditions of the contract is repugnant to the terms contained in the special conditions of contract and such repugnancy cannot be reconciled at all; the intention is not to render any clause as invalid or inapplicable except in case of direct and irreconcilable repugnancy.
- 1.4. Wherever it is stated in these documents that a supply is to be affected or a work is to be carried out, it shall be understood that the same shall be effected/carried out by the Contractor at his own cost, unless a different intention is specifically and expressly stated herein or otherwise explicit from the context.

2. SCOPE OF WORK

The general character and the scope of work to be carried out under this contract are illustrated in Drawings, Specifications and Schedule of Quantities. The Tenderer shall carry out and complete the said work under this contract in every respect in conformity with the contract documents and with the direction of and to the satisfaction of the COR. The tenderer shall furnish all labour, materials and equipment (except those to be supplied by the OWNER) as listed under Bill of Quantities and specified otherwise, transportation and incidental necessary for supply and installation of the complete Works as described in the Specifications and as shown on the drawings. This also includes any material, equipment, appliances and incidental work not specifically mentioned herein or noted on the Drawings/ Documents as being furnished or installed, but which are necessary and customary to be performed under this contract. The Works under this Contract shall comprise of (but not limited to) following:

- a. Opening up of existing finishes carefully to expose portions of structural / Architectural elements where the new structure has to be anchored etc.
- b. Providing and fixing/ erecting all necessary structural members, plates, anchors and other accessories etc. required for erection of the foundation as per design/ instructions.
- c. Provision of hangers/ additional support/ members etc. required for fixing of other trades such as roofing, suspended ceiling, cable trays, gutters, lights & signage's etc. and for providing necessary access to the terrace and these fixtures etc.
- d. Application of priming and paint coats as per specifications.
- e. Cutting holes, chases & like through all types of walls/ Columns / beams /floors and finishing for all anchorages, including sealing, providing cover plates, making good structure and finishes to an approved standard.

3. SPECIFICATIONS

- 3.1. Works under this tender shall be carried out strictly in accordance with specifications attached with the tender. The Specifications shall be considered as part of this contract.

4. BYE-LAWS AND REGULATIONS

The installation shall confirm to the schematic line diagram & drawings attached / instructions issued from time to time. The installation shall be in conformity with the Bye-laws, Regulations and Standards of the local authorities concerned, in so far as these become applicable to the installation. But if these Specifications and Drawings call for a higher standard of materials and / or workmanship than those required by any of the above regulations and standards, then these Specifications and Drawings shall take precedence over the said regulations and standards. However, if the Drawings and specifications require something which violates the Bye-laws and Regulations, then the Bye-laws and Regulations shall govern the requirement of this installation.

5. TENDER DRAWINGS

The structural, services and architectural Tender Drawings indicate the extent and general arrangement of the Works to be carried out. These drawings are essentially diagrammatic. The work shall be installed as indicated on the Drawings. The data given herein and on the Drawings is as exact as could be secured, but its complete accuracy is not guaranteed. The drawings are for the guidance of the contractor, exact locations, distances and levels shall be governed by the site conditions and the Architectural & Services layouts/ requirements. The tenderer shall examine all architectural, structural and other services drawings and check the as-built works before bidding for the work, report to the COR any discrepancies and obtain clarification. However, any change found essential to coordinate the installation of this work with other services and trades shall be made with prior approval of the COR and without any additional cost to the Owner.

The tenderer shall follow the tender drawings in preparation of his shop/ fabrication drawings, and for subsequent installation work he shall follow only the approved shop drawings. He shall also check the drawings of other trades to verify spaces in which his work will be installed.

Contractor shall maintain one set of all drawings issued to him as reference drawings. These shall not be used on site. All-important drawings shall be mounted on boards and placed in racks properly indexed. No drawings shall be rolled.

All corrections, deviations and change made on the site shall be shown on these reference drawings for final incorporation in the completion drawings. All changes to be made shall be initialled by the COR.

Any drawings issued by the COR for the work are the property of the Architects/ Consultant / Owner and shall not be lent, reproduced or used on any works other intended without the written permission of the COR.

6. CODES/ REFERENCES

Applicable Indian building codes including all amendments up to tender closing date. In case of conflict, the more stringent requirement will apply unless ruled otherwise by the COR.

Those items for which detailed specification have not been included in the contract documents shall be executed as per relevant International / CPWD/ I.S. Codes specification, good engineering practice and/or as per the instruction/ suggestions of the COR. Wherever IS codes are silent, General Engineering practices shall be followed under direction of COR.

7. DOCUMENTS REQUIRED AT JOB SITE

Contractor to maintain one copy of following at all times on site:

- Contract documents
- Reviewed shop drawings
- Site Order Book
- Field test reports
- Updated version of approved work schedule.
- Relevant IS Codes

– CPWD Specifications 2016 with up-to-date correction slips

8. EXTRA ITEMS

For any extra item to be executed the COR shall issue a contemplated change order in the approved format on the basis of analysis of cost of the item. The following procedure shall be meticulously adopted for the purpose of cost analysis:

- (a) The item shall be derived from similar items in the scope of work of the Contractor. In case similar items are not available, it shall be derived considering the Prime cost of materials with available discounts factored in. Labour as per item/ industry standard shall be added to the same. O.H. and profit of the Contractor shall be loaded by the agreed %age. VAT/ Service Tax etc. shall be payable as applicable.
- (b) The coefficient of labour, material and wastage shall be adopted as/ CPWD norms or in case not available therein, they shall be adopted from standard analysis of Rate manuals available in the market. The decision of the COR shall be final in deciding which manual to be referred to.

9. TECHNICAL EXAMINATION/ AUDIT

The Contractor herewith agrees to fully cooperate with the Technical Examiner appointed by the COR for Audit of Contractor's work and Bills under this Contract. The Contractor shall provide all necessary assistance for the same including covering/ uncovering & testing of part works as required; recheck of the bills and supply of all supporting vouchers, invoices and other documents etc. in support of authenticity of materials and rates for his work. It is understood that in case as a result of audit of the works and the Contractor's bills by the Technical Examiner, any sum is found to have been over paid in respect of any work done by the Contractor under the contract or any work claimed by him to have been done by him under the contract and found not to have been executed by him or not in accordance with the contract, the Contractor shall be liable to refund the amount of over payment made already and it shall be lawful for the COR as he deems fit, to recover such over payment either from any payments due and/or becoming due to the Contractor or from the security deposit or retention money or through any further bills and/or final bill or in any other manner whatsoever not excluding though recourse to legal action.

It is an essential and agreed condition of the contract that any such action taken by the COR shall be deemed to be completely legal and valid and shall be binding on the Contractor.

Notwithstanding anything contained in this Clause, the COR shall be entitled to avail all such remedies against the Contractor, as may be available to it under any applicable law.

10. VARIATIONS

The quantities in the Bill of Quantities are estimated and can vary as per site &/ on detailed shop drawings approval. The Contractor to do his own assessment of the same and notify to the COR if any quantities are likely to be different from those mentioned in the Bill of Quantities before submitting his bid.

11. SAFETY MEASURES

It shall be the sole responsibility of the Contractor to ensure all safety measures giving proper prior notices etc. and obtaining prior permission at his own cost from concerned local authorities as per bye-laws or directions issued by them. No claim of the Contractor in this regard shall be entertained and the Contractor hereby waives all/any remedy against the Owner in this regard, to which the Contractor would otherwise be entitled to under any Statutory Law/ Rules/ Regulations/ Act etc.

12. QUALITY OF MATERIALS & REMOVAL OF SUB-STANDARD MATERIALS

The Contractor shall furnish if & when required by the COR original invoices/ vouchers to prove that the materials procured are as per specifications.

Any material/ item/ fitting/ fixtures rejected by the COR shall be removed from the site within 48 hours of issue of instructions to this effect by the COR. Failing this, the COR shall have the right to

get these so removed at the Contractor's risk and cost and the Contractor shall have no claim whatsoever in this regard.

13. ALTERATIONS, ADDITIONS AND OMISSIONS

The COR can make any variations of the form, quality or quantity of the works or any part thereof that may in his opinion be necessary. He shall have power to order in writing the Contractor to do any of the following:

- i) Increase or decrease in the quantity of any work included in the contract in which case the value of contract may be increased or decreased in the same proportion.
- ii) Omit any such work.
- iii) Change the levels, lines, positions and dimensions of any part of the works and
- iv) Execute additional work of any kind necessary for the completion of the work

No such variations shall in any way vitiate or invalidate the contract, but the value, if any of all such variations shall be taken into account in ascertaining the amount of the Contract Price.

The Contractor shall not affect any of the aforementioned changes without the written order of the COR.

14. RESPONSIBILITY FOR PROCUREMENT

Sole responsibility rests with Contractor for procurement of all materials required for satisfactory completion of work within the stipulated time. Also, the responsibility of correctness of quantity of material brought by him on the site shall be his. Nothing extra to be paid to the Contractor on this account.

15. TAXES/DUTIES

The quoted price shall be deemed to be all-inclusive prices including the liability of all types of taxes & duties etc. unless specifically mentioned otherwise in the Bill of quantities.

16. REMOVAL OF PLANT AND EQUIPMENT FROM SITE

All materials, tools, tackles plant and equipment brought to the site by the Contractor shall not be removed from the work site without prior written permission of the COR.

17. SITE ORDER BOOK

The Contractor shall maintain a site order book at site of the work. Any special orders and instructions to be issued to the Contractor at site will be recorded in this book which will be numbered and initialled by the COR. The Contractor will however sign all the orders as a token of information received by him and take action accordingly.

18. MEASUREMENT

Unless otherwise specified in the BOQ's & /or General Technical specifications, the method of measurement shall be according to I.S. codes/ CPWD Specifications with up-to-date corrections. The Contractor undertakes to ensure that all measurements are done correctly and there are no errors.

19. GUARANTEES & PERFORMANCE GUARANTEE

All guarantees and test certificate for the entire work shall be transferred to the Owner by the Contractor on virtual/interim completion of the work. All guarantees shall be for the values and duration as mentioned in specification/ items description.

20. SETTING OUT OF WORK

The Contractor shall: -

- i) Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- ii) Provide appropriate devices needed to layout and construction work. The COR's decision shall be final in deciding the appropriateness of the equipment required.

- iii) Supply stakes and other survey markers required for laying out work.

21. CUTTING AND PATCHING

The Contractor shall

- i) Obtain COR's approval before cutting, boring or sleeving.
- ii) Use core cutting / concrete / marble / wood cutter only depending on the material being cut.
- iii) Cut and patch as required to make the work look as if no patch work is done on it.
- iv) Make cut with clean, true, smooth edges.
- v) Where new work connects with existing and where existing work is altered, cut patch and make good to match existing work.

22. BRAND NAME

The specific reference in the Specification and documents to any material by trade name, make or catalogue number shall be construed as establishing standard or quality and performance and not as limiting competition. The Contractor shall confirm choice of the specific brand out of the list of approved makes enclosed after verifying its applicability and availability etc. while quoting for this Tender.

23. SHOP DRAWINGS, PRODUCT DATA

- i) Shop Drawings or Fabrication drawings are drawings, diagrams, schedule and other data specially prepared for the work by the Contractor or a Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the work.
- ii) Product Data are illustrations, standard schedules, performance charts, instructions brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the work.
- iii) Samples are physical examples, which illustrate materials, equipment or workmanship and establish standards by which the work will be judged.
- iv) Shop Drawings, Product Data, Samples and similar submittals are not Contract Document. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract documents.
- v) The Contractor shall submit to the COR for his review and approval all Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the work or in the activities of the Owner or of separate Contractors. Submittals made by the Contractor which are not required by the Contract Document may be returned without action. For the purpose of record keeping, the Contractor shall on all submittals, indicate the date the Contractor submitted each submittal. The COR shall not be required to take any action on any submittal not showing such dates.
- vi) The Contractor shall perform no portion of the work requiring submittal and review of Shop drawings, Product Data, Samples or similar submittal until the respective submittal has been approved by the COR. Such work shall only be done in accordance with approved submittals.
- vii) By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so and has checked and coordinated the information contained within such submittals with the requirements of the work and the Contract Documents.
- viii) The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the COR's approval of Shop Drawings, Products Data Samples or similar submittals unless the Contractor has specifically informed the COR in writing of such deviation at the time of submittal and the COR has given written approval to the specific deviation. The

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SPECIAL CONDITIONS & SPECIFICATIONS

Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the COR approval thereof.

- ix) The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals to revision other than those requested by the COR on previous submittals.
- x) When professional certification of performance criteria of materials, systems or equipment is required by the Contractor Documents, the COR shall be entitled to rely upon the accuracy and completeness of such calculations and certifications. The COR may advise the Contractor of alternatives relating to equipment or systems designed by the Contractor for the sole purpose of providing to the Contractor additional information which the Contractor may choose to utilize in the Contractor's design. The Contractor shall evaluate the alternatives in terms of its original design and assess whether to incorporate any of them; the design of such systems or equipment is to remain the exclusive responsibility of the Contractor. Any subsequent action taken on submittals or any certification made by the COR, as contemplated in the Contract Documents, shall not constitute an approval of or representative by the COR of the appropriateness of the systems or equipment designed by the Contractor or the Contractor's decision whether to utilize alternatives of which the Contractor was advised by the COR.
- xi) Without limiting the generality of any related provision contained in any other Contract Documents, the Contractor to the fullest extent possible under applicable statutory and common law, hereby disclaims any and all copyrights or other intellectual property rights in the shop Drawings or any other materials produced by Contractor pursuant to the execution of the contract and hereby acknowledge and agrees that all such copyright or other intellectual property right shall rest solely and absolutely in the Owner.
- xii) All the shop drawings shall be prepared on computer through AutoCAD System and shall be in colour prints based on Architectural/ Services Drawings and site measurements. Within one week of the award of the contract, tenderer shall furnish, for the approval of the COR, two sets of detailed shop drawings of all fabrication work including layouts and supports and termination details and any other requirement to be fabricated or purchased by the contractor.

These shop drawings shall contain all information required to complete the Project as per specifications and as required by the Architect/Consultant/COR. These Drawings shall contain details of construction, size, arrangement, operating clearances, performance characteristics and capacity of all items of equipment, also the details of all related items of work by other tenderers. Each shop drawing shall contain tabulation of all measurable items of materials/works and progressive cumulative totals from other related drawings to arrive at a variation-in-quantity statement at the completion of all shop drawings. Minimum 4 sets of drawings shall be submitted after final approval along with CD.

- xiii) Each item of equipment/material proposed shall be a standard catalogue product of an established manufacturer strictly from the manufacturers listed in List of approved Makes and quoted by the tenderer in technical data part.
- xiv) When the Architect/Consultant makes any amendments in the above drawings, the tenderer shall supply two fresh sets of drawings with the amendments duly incorporated along with check prints, for approval. The tenderer shall submit further six sets of shop drawings to the COR for the exclusive use by the COR and all other agencies. No material or equipment may be delivered or installed at the job site until the tenderer has in his possession, the approved shop drawing for the particular material/equipment/installation.
- xv) Shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any material to allow Architect/Consultant/ COR ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved programme.

- xvi) Manufacturer's drawings, catalogues, pamphlets and other documents submitted for approval shall be in four sets. Each item in each set shall be properly labelled, indicating the specific services for which material or equipment is to be used, giving reference to the governing section and clause number and clearly identifying in ink the items and the operating characteristics. Data of general nature shall not be accepted.
- xvii) Samples of all materials like Anchors, welding rods etc. shall be submitted to the COR prior to procurement. These will be submitted in two sets for approval and retention by COR and shall be kept in their site office for reference and verification till the completion of the Project. Wherever directed a mock-up or sample installation shall be carried out for approval before proceeding for further installation.
- xviii) Approval of shop drawings shall not be considered as a guarantee of measurements or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the tenderer of the responsibility or requirement to furnish material and perform work as required by the contract.
- xix) Where the tenderer proposes to use an item of equipment, other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundation, piping, wiring or any other part of the mechanical, electrical or architectural layouts; all such re-design, and all new drawings and detailing required therefore, shall be prepared by the tenderer at his own expense and got approved from the Architect/Consultant/ COR. Any delay on such account shall be at the cost of and consequence of the Tenderer.
- xx) The Contractor shall extend full cooperation to other specialised contractor in preparation of their coordinated Sheetting /services drawings. He shall issue CD's and hard prints of his shop drawings to other specialised contractor well in advance to complete the co-ordinated Sheetting /services drawings in accordance with schedule prepared by the COR. The Contractor shall prepare coordinated shop drawings based on the drawings prepared by other specialised Vendors etc. to ensure adequate clearances are available for installation for each trade.
- xxi) Where the work of the tenderer has to be installed in close proximity to, or will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the COR, the tenderer shall prepare composite working drawings and sections at a suitable scale, not less than 1:50, clearly showing how his work is to be installed in relation to the work of other trades. If the Tenderer installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make all the necessary changes without extra cost to the OWNER.
- xxii) Within one week of approval of all the relevant shop drawings, the tenderer shall submit four copies of a comprehensive variation in quantity statement, and itemized price list of recommended (by manufacturer's) imported and local spare parts and tools, covering all equipment and materials in this contract.

24. CONTRACTOR'S MINIMUM SITE SUPERVISION ORGANIZATION

The Contractor shall ensure that senior planning and erection personnel from his organization are assigned exclusively for this project and shall depute adequate qualified site supervisory staff after the award of the Contract.

For quality control & monitoring of workmanship, contractor shall additionally assign at least one full-time engineer who would be exclusively responsible for ensuring strict quality control, adherence to specifications and ensuring top class workmanship. Contractor shall furnish details of licenses of supervisors/workmen to be employed at site.

The entire staff shall be posted at site on full time basis and their CV's shall be got approved from the COR before being deployed at site. Separate ID card to be given by the Contractor to each worker working on site.

The project management shall be through modern technique. The Contractor's office shall be fully equipped with Internet, computers & plotter etc. and shall prepare proper bar chart and completion schedules etc. to ensure timely completion. Erection engineer and supervisors shall be provided with mobile communication system so that they can always be reached.

Notwithstanding the requirements given above, the Contractor shall deploy on site additional manpower that is required in the assessment of the COR for carrying out the works.

25. TECHNICAL DATA

Each tenderer shall submit along with his tender, the technical data for all items asked for in the indicated format. Failure to furnish complete technical data with tenders may result in summary rejection of the tender.

26. EXECUTION OF WORK

26.1 The work shall be carried out in conformity with the approved shop drawings and within the requirements of Architectural, Structural and other Services drawings.

26.2 The contractor shall cooperate with all trades and agencies working on the site. He shall provide details of and/ or make provision for hanger, sleeves, structural openings and other requirements well in advance to prevent hold up of progress of the construction schedule.

27. COMPLETION DRAWINGS & MANUALS

Tenderer shall periodically submit completion drawings of various services as and when work in all respects is completed in a particular area. These drawings shall be submitted in the form of two sets of CD's, 4 sets of As built drawings in the size and scale as per the approval of the Architect / COR and four portfolios (300 x 450 mm) each containing complete set of coloured drawings on approved scale indicating the work 'as – installed'. All "warranty cards" given by the manufacturers shall be handed over to the COR along with this set.

The certificate of virtual completion shall not be issued unless the above drawings are submitted and approved by the COR.

28. INSPECTION AND TESTING

As and when required by COR, the Contractor shall provide all facilities for inspection of contract works and materials at his own cost. All tests shall be carried out by a test house approved by the COR.

- i) All requisite Tests as per I.S. / Tender stipulations are to be carried out by the Contractor at his own cost and results submitted to the COR. This, however, does not absolve the Contractor from his responsibility for the overall quality, kind, strength and stability of the structures.
 - ii) In case of discrepancy in frequency of tests asked for by the COR & that given in CPWD Specification and other related IS Codes, the higher of two shall be followed and nothing extra shall be payable to Contractor on this account.
- 28.1 Contractor shall be required to produce original manufacturers test certificate for the particular batch of materials supplied to him. The tests carried out shall be as per the relevant Standards. **No payment shall be made without test certificate of the item.**

The Contractor shall provide all necessary instruments and labour for testing, shall make adequate records of test procedures and readings, shall repeat any tests requested by the COR and shall provide test certificate signed by an authorised person. Such test shall be conducted on all materials and equipment and tests on completed work as called for by the COR at contractor's expenses unless otherwise called for.

If it is proved that the installation or part thereof is not satisfactorily carried out then the Contractor shall be liable for the rectification of the same. COR's decision as to what constitutes a satisfactory installation shall be final.

29 LABORATORY

Contractor shall establish a field Laboratory as required / as per the instructions of the COR. Contractor shall employ an experienced Lab Technician who will be responsible for running & maintaining the Field Laboratory. The requisite tests shall be conducted in field laboratory as per CPWD Specification and other related IS Codes. The Contractor shall bear all expenses for installing, running and maintenance of this Field Laboratory. The equipment shall be got recalibrated from time to time and necessary test certificates certifying their accuracy shall be maintained on site.

30 HOUSE KEEPING ON SITE

The site & structures thereon shall be kept clean and free of water logging, debris & rubbish etc. at all times. The Contractor shall periodically remove rubbish, debris, sludge and / or prevent water logging etc. on and around the Site. The building material & tools / tackles etc. shall be stacked in a manner to present a neat appearance. Excess materials and tools and plants etc. shall be immediately removed on completing of the relevant activity from any given area. Regular clearing of left-over building material and rubbish shall be carried out and areas where work is not being carried out shall be kept in a broom swept condition at least. All due care shall be taken to prevent Water from entering into basements and or Pits and shafts etc. Temporary Kerbs and coverings on openings shall be provided for prevention of the same. However, in the event of water collection/ percolation etc. either due to sub soil water table or rain or curing of run off etc. the Contractor shall make immediate provisions for pumping/ bailing out of the same. All the above is deemed to be included in the Contractor's rates and nothing extra shall be paid on this account.

31 SHORING & PROTECTION OF WORKS

The Contractor shall supply, fix and maintain at his cost, during the execution of any works all the necessary centring, scaffolding, staging, planking timbering, strutting, shoring, pumping, fencing, boarding, watching and lighting by night as well as by day, required not only for the proper execution and protection of the said work, but also for the protection of the public and the safety of any adjacent roads, streets, cellars vaults, pavements, walls, houses, buildings and all other erections, matters or things. The Contractor shall take down and remove all such centring, scaffolding, slugging, planking, timbering, strutting, shoring etc. as occasion shall require or when ordered so to do, and shall fully reinstate and make good all matters and things disturbed during the execution of the works to the satisfaction of COR.

32 RECORD DRAWINGS

- i) Contractor shall provide two sets of as built drawings i/c a soft copy thereof on a CD for all shop drawings made and submitted by him.
- ii) Maintain Project record drawings and record accurately deviations from Contract Documents.
- iii) Record changes in red. Mark in one set of prints and at completion of project and prior to final inspection by COR, neatly transfer notations to second set and submit both sets to COR.
- iv) Record following information:
 - Depths of various elements of foundation in relation to datum.
 - Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
 - Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - Field changes of dimension and details
 - Changes made by Change Order.

The above set of as built drawings shall be submitted before submission of final bill.

GENERAL TECHNICAL SPECIFICATIONS

SECTION – S.01 GENERAL

- 1.1 Technical Specifications contained herein shall be read in conjunction with other tender documents.
- 1.2 The Work shall be carried out in accordance with the "Good for Construction" drawings and designs as would be issued to the Contractor by the COR duly signed and stamped by him. The Contractor shall not take cognisance of any drawings, designs, specifications, etc. **not** bearing COR's signature and stamp. Similarly, the Contractor shall not take cognisance of instructions given by any other Authority except the instructions given by the COR in writing.
- 1.3 The work shall be executed and measured as per metric units given in the Bill of Quantities, drawings etc. (FPS units where indicated are for guidance only).
- 1.4 Absence of terms such as "Providing, supplying, laying, installing, fixing etc." in the descriptions does not even remotely suggest that the Contractor is absolved of such providing, supplying etc., unless an explicit stipulation is made in this Contract. The Owner shall not bear any costs of materials, labour, equipment, duties, taxes, royalties, cartage, handling, rehandling etc. for completing the work in all respects and maintaining the works during its maintenance and guarantee period.
- 1.5 The specifications may have been divided into different sections / sub-heads for convenience only. They do not restrict any cross-references. The Contractor shall take into account inter-relations between various parts of works/trades. No claim shall be entertained on the basis of compartmental interpretations.
- 1.6 Except where distinguished by BOQ, the rates apply to all heights, leads, depths, sizes, shapes and locations. They also cater for all cuts and wastages.
- 1.7 **Reference to the Standard Codes of Practice:**
 1. The Contractor shall make available at Site all relevant Codes of practice as applicable to the works.
 2. Legend:

ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
BS	British Standard
CPWD	Central Public Works Department
DIN	Deutsches Institute for Normung E.V.
IRC	Indian Roads Congress
IRS	Indian Railway Standards
IS	Indian Standards
JIS	Japanese Industrial Standard
MOST	Ministry of Surface Transport

1.8 Contractor to Provide:

The Contractor shall provide and maintain at Site throughout the period of works the following at his own cost and without extra charge, the cost being held to be included in the Contract Rates unless otherwise specified:

- 1 General works such as setting out, Site clearance before setting out and on completion of works. All weather approach roads to the Site office should also be constructed and maintained in good condition.
- 2 All labour, materials, plant, equipment and temporary works, overhead charges as well as general liabilities, obligations, insurance and risks arising out of GCC, required to complete and maintain the works to the satisfaction of the COR.
- 3 Adequate lighting for night work, corridors staircases & accesses, for areas where it is required for work during daytime as well, and also whenever and wherever required by the COR.
- 4 Contractor shall provide temporary fences, barricades all along the Site perimeter, guards, lights, proper signage and protective work necessary for protection of Workmen, Supervisors, Engineers, General public and any other persons, permitted access to the Site. Removal of all such barricades, rectification of damages to the surrounding surfaces etc. as per instructions of the COR shall be deemed to be included in the rates.
- 5 All equipment, instruments, labours and materials required by the COR for checking alignment, levels, slopes and evenness of surfaces measurements and quality etc.
- 6 Design mixes and testing them as per relevant clauses of specifications and codes giving proportion of ingredients, sources of aggregates and binder along with accompanying trial mixes from approved agency. Test results to be submitted to the COR for his approval before adoption on works. The same shall be redone in case of change in the nature or source of any of the ingredients or as per instructions of the COR.
- 7 Cost of Preparation and compliance with provision of a quality assurance control programme.
- 8 Cost of safeguarding the environment during construction.
- 9 The Contractor shall procure any/all apparatus, which is required to carry out the field test during the execution of work
The testing machines/ apparatus shall be recalibrated periodically and as directed by COR.

1.9 QUALITY ASSURANCE & QUALITY CONTROL:

- 1 The work shall conform to high standards of design and workmanship and shall be structurally sound and aesthetically pleasing. The Contractor shall conform to the Quality standards as prescribed below, which shall form the backbone for the Quality Assurance and Quality Control system.
- 2 At the Site, the Contractor shall arrange the materials, their stacking/ storage in appropriate manner to ensure the quality. The Contractor shall provide all the necessary equipment and qualified manpower to test the quality of materials, assemblies etc., as directed by the COR. The tests shall be conducted at specified intervals and the results of tests properly documented. In addition, the Contractor shall keep appropriate tools and equipment for checking alignments, levels, slopes and evenness of the surfaces.
- 3 The COR shall be free to carry out such tests as may be decided by him at his sole discretion, from time to time, in addition to those specified in this document. The Contractor may provide the samples and labour for collecting the samples. Nothing extra shall be payable to the Contractor for samples or for the collection of the samples.
 - a) The test shall be conducted at the Site laboratory that may be established by the Contractor or at any other Standard Laboratory selected by the COR.
 - b) The Contractor shall transport the samples to the approved laboratory for which nothing extra shall be payable. In the event of the Contractor failing to arrange transportation of the samples in proper time the COR shall have them transported and recover two times the actual cost from the Contractor's bills.

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- c) All testing shall be performed in the presence of COR. The Contractor or his authorised representative, if permitted by the Test House, may witness testing. Whether witnessed by the Contractor or not, the test results shall be binding on the Contractor.
- 4 The COR shall have the right at all times to inspect all operations including the sources of materials, procurement, layout and storage of materials, all equipment, and the quality control system. Such an inspection shall be arranged and the COR's approval obtained prior to starting of the particular item of work. This shall however, not relieve the Contractor of his responsibilities. All materials, which do not conform to these specifications, shall be rejected and shall be removed from the Site immediately. If the Contractor fails to remove the rejected materials from the Site within the specified time after their rejection, the COR shall get the same removed at the risk and cost of the Contractor. No claim financially or otherwise shall be entertained on account of any such reason whatsoever.

Any material used on work without prior inspection (and testing where testing is necessary) and without approval of the COR, is liable to be considered unauthorised, defective and not acceptable. The COR shall have full powers to order dismantling such work in which such unapproved materials have been used and removal of such materials brought to Site by Contractor which are not in accordance with the Contract specifications or do not conform in character or quality to samples approved by him. In case of default on the part of the Contractor in removing rejected materials and any work executed with such unaccepted materials, the COR shall be at liberty to have them removed and/or dismantled by other means at the risk and cost of the Contractor.

The COR shall have the powers to cause the Contractors to purchase and use materials from any particular source, as may be necessary in the opinion of COR, for the proper execution of work.

- 5 The decision of the COR regarding type of tests, their frequency etc. shall be final and binding on the Contractor notwithstanding any other provision contained in the tender documents. No claim financially or otherwise shall be entertained on this account.

1.10 DIMENSIONS:

- 1 Figured dimension on drawings shall only be followed and drawings to a large scale shall take precedence over those to a smaller scale. Special dimensions or directions in the specifications shall supersede all others. All dimensions shall be checked on Site prior to execution.
- 2 The dimensions where stated do not allow for waste, laps, joints, etc. but the Contractor shall provide at his own cost sufficient labour and materials to cover such waste, laps, joints, etc.
- 3 The levels, measurements and other information concerning the existing Site as shown on the drawings are believed to be correct, but the Contractor should verify them for himself and also examine the nature of the site conditions as no claim or allowance whatsoever will be entertained on account of any errors or omissions in the levels or the description of the site conditions or strata turning out different from what was expected or shown on the drawings.

1.11 SETTING OUT OF WORKS:

The Contractor shall set out the Works indicated in the Conditions of Contract. The Contractor shall provide suitable stones with flat tops and build the same in concrete for temporary benchmarks. All the pegs for setting out the Works and fixing the levels required for the execution thereof shall, if desired by the COR, likewise be built in masonry at such places and in such a manner as the COR may direct. The Contractor shall carefully protect and preserve all benchmarks and other marks used in setting out the works. The Contractor will make overall layout of complete work and get it checked from the COR. The cost of all operations of setting out including construction of benchmarks and maintaining them until the completion of works in all respects is deemed to be included in the quoted rates.

1.12 MATERIALS:

- 1 **Source of Materials:**

It shall be the responsibility of the Contractor to procure all the materials required for construction and completion of the Contract. The Contractor shall indicate in writing the source of materials well in advance to the COR, after the award of the work and before commencing the work. If the material from any source is found to be unacceptable at any time, the COR shall reject it and the Contractor shall forthwith remove the material immediately from the Site as directed by the COR.

2 Quality:

All materials used in the works shall be of the best quality of their respective kinds as specified herein, obtained from sources and suppliers approved by the COR and shall comply strictly with the tests prescribed hereafter, or where tests are not laid down in the specifications, with the requirements of the latest issues of the relevant Indian Standards.

3 Sampling and Testing:

All materials used in the works shall be subjected to inspection and test, in addition to test certificates. Samples of all materials proposed to be employed in the permanent works shall be submitted to the COR for approval before they are brought to the Site.

Samples required for approval and testing must be supplied in required quantity sufficiently in advance to allow for testing and approval, due allowance being made for the fact that if the first samples are rejected further samples may be required. Delay to the works arising from the late submission of samples will not be acceptable as a reason for delay in completion of the works.

Samples provided to the COR for their retention is to be labelled in boxes suitable for storage. The COR will reject materials or workmanship not corresponding in character and quality with approved samples.

Materials shall be tested before leaving the manufacturer's premises, quarry or resource, wherever possible. Materials shall also be tested on the Site and they may be rejected if not found suitable or in accordance with the specification, notwithstanding the results of the tests at the manufacturer's works or elsewhere or test certificates or any approval given earlier.

The Contractor will bear all expenses for sampling and testing, whether at the manufacturer's premises, at source, at Site or at any testing laboratory or institution as directed by the COR. No extra payment shall be made on this account.

4 Despatch of materials:

Materials shall not be despatched from the manufacturer's works to the Site without written authority from the COR.

5 Test certificates:

All manufacturer's certificates of test, proof sheets, etc. showing that the materials have been tested in accordance with the requirement of this specification and of the appropriate Standard are to be supplied free of charge on request to the COR.

6 Rejection:

Any materials that have not been found to conform to the specifications will be rejected forthwith and shall be removed from the Site by the Contractor at his own cost within two weeks or as instructed by the COR.

7 The COR shall have power to cause the Contractors to purchase and use such materials from any particular source, as may in his opinion be necessary for the proper execution of the work.

1.13 STORING OF MATERIALS AT SITE:

All materials used in the works shall be stored on racks, supports, in bins, under cover etc. as appropriate to prevent deterioration or damage from any cause whatsoever to the entire satisfaction of the COR.

The storage of materials shall be in accordance with IS: 4082 "Recommendation on stacking and storage of construction materials on Site" and as per IS: 7969 "Safety code for handling and

storage of building materials". Storage and safe custody of materials shall be the responsibility of the Contractor.

The materials shall be stored in a proper manner at places at Site approved by the COR. Should the place where material is stored by the Contractor be required by the Employer for any other purpose, the Contractor shall forthwith remove the material from that place at his own cost and clear the place for the use of the Employer.

The quoted rates for various items shall be deemed to have included the cost of storage. The storage space shall be open for inspection as and when required by the COR.

If explosives or inflammable materials are to be used for execution of the works, the Contractor shall at his expense obtain such licences as may be required for storing and using explosive and/or inflammable materials. Contractor shall at his own cost locate, construct and maintain magazines if such materials are required for storage, in accordance with the requirements of the appropriate rules in force for their use and safety.

1.14 WATER:

1 Water from approved source:

Potable water only shall be used for the works. The water shall be free from any deleterious matter in solution or in suspension and be obtained from an approved source. The quality of water shall conform to IS: 456.

2 Storage:

The Contractor shall make his own arrangements for storing water, if necessary, in drums or tanks or cisterns, to the approval of the COR. Care shall be exercised to see that water is not contaminated in any way.

3 Testing:

Before starting any concreting work and wherever the source of water changes, the water shall be tested for its chemical and other impurities to ascertain its suitability for use in concrete for approval of the COR. No water shall be used until tested and found satisfactory. Cost of all such Tests shall be borne by the Contractor.

1.15 CEMENT:

The grade of cement shall be as specified and shall conform with the relevant IS code and shall be purchased from the approved manufacturers. Only fresh cement should be used and cement older than 3 months will not be allowed to be used at Site. The cement should be stored in water tight shed and on wooden planks giving sufficient gaps between walls floors and cement piles.

The actual issue and consumption of cement in works shall be regulated and proper accounts maintained as provided in the relevant clause of the Contract. The theoretical consumption of cement shall be worked out as per procedure prescribed in relevant clause of the Contract and shall be governed by conditions laid therein.

Cement (OPC) of 43/53 grade and Portland Slag Cement (PSC) as specified in documents in paper bags or any suitable packing shall be arranged by the Contractor.

1.16 COARSE AGGREGATE:

Coarse aggregate in size and quality shall be conforming to the relevant IS code and as specified in the documents. The nominal maximum size of aggregate (MSA) to be used in RCC and PSC work shall be 20mm. The other requirement shall be as per CPWD specification.

The aggregate shall be stored in such a way as to prevent mixing with foreign materials. Different sizes of coarse aggregate shall be stored in separate stockpiles sufficiently away from each other in order to prevent inter-mixing the materials at the edges of the stockpiles.

1.17 FINE AGGREGATE:

The quality, tests and acceptance criteria for fine aggregates shall be same as per CPWD specifications. The fine aggregate shall conform to Zone II or Zone III of CPWD specifications as per requirement of trial mix design (or any combination of the two as approved by COR and the decision of COR in this respect shall be final). The silt content of fine aggregate used for trial mixes shall be recorded & the silt content in fine aggregate used shall neither exceed 8%, nor 1% more than that of the fine aggregate used in the trial-mix.

1.18 OTHER MATERIALS:

All other materials not specifically mentioned above shall be of best quality and shall conform to manufacturer's specification. Wherever, no specific code of practice of BIS is applicable, the decision of COR shall be final and binding.

1.19 WORKMANSHIP:

- 1 All works shall be true to level, plumb and square and the corners, edges and arises in all cases shall be unbroken and neat.
- 2 Any work not to the satisfaction of the COR or his representative will be rejected and the same shall be rectified, or removed and replaced with work of the required standard of workmanship at no extra cost.

1.20 LOAD TESTING ON COMPLETED STRUCTURES

1.20.1 During the period of construction or within the maintenance period the COR may at his discretion, order the load testing of any completed structure or any part thereof as per relevant IS codes, if he has reasonable doubts about the adequacy of the strength of such structure for any of the following reasons:

- a) results of compressive strength on concrete test cubes falling below the specified strength.
- b) premature removal of formwork.
- c) inadequate curing of concrete.
- d) over loading during the construction of the structure or part thereof.
- e) carrying out concreting of any portion without prior approval of the COR.
- f) honey combed or damaged concrete, which in the opinion of the COR is particularly weak and will affect the stability of the structure to carry the design load, more so in important or critical areas of the structure.
- g) any other circumstances attributable to alleged negligence of the Contractor, which in the opinion of the COR may result in the structure or any part thereof being of less than the expected strength.

1.20.2 All the loading tests shall be carried out by the Contractor strictly in accordance with the instructions of the COR, IS: 456 and IRC SP 51:1999 and as indicated hereunder. Such tests shall be carried out only after expiry of minimum 28 days or such period as directed by the COR.

1.20.3 The structure shall be subjected to a super-imposed load equal to 1.25 times the specified superimposed load assumed in the design. This load shall be maintained for a period of 24 hours before removal. During the test, struts strong enough to take the whole load shall be placed in position leaving a gap under the members as directed. The deflection due to the superimposed load shall be recorded by sufficient number of approved deflect meters capable of reading up to 1/500 of a cm and located suitably under the structure as directed by the COR.

The structure shall be deemed to have passed the test if the maximum deflection at the end of 24 hours of loading does not exceed the deflection given by the following expressions:

$D = 0.001 L^2 / 25 T$, where,

D = max deflection due to imposed load only

L = span of the member under load test (the shorter span in case of slabs). The span is the distance between centres of the supports, or the clear distance between the supports plus the depth of the

member, whichever is smaller. In case of cantilever, this shall be taken, as twice the distance from the support to the end and deflection shall be adjusted for movement of the support.

T = depth of member.

If within 24 hours of the removal of the superimposed load, the structure does not recover at least 75% of the deflection under the superimposed load, the test loading shall be repeated after a lapse of 72 hours. If the recovery after the second test is less than 80% of the maximum deflection shown during the second test, the structure shall be considered to have failed to pass the test and shall be deemed to be unacceptable.

1.20.4 In such cases the portion of the work concerned shall be taken down or cut out and reconstructed to comply with the specifications. Other remedial measures may be taken to make the structure secure at the discretion of the COR. However, such remedial measures shall be carried out to the complete satisfaction of the COR.

1.20.5 All costs involved in carrying out the tests (except the test items in BOQ) and other incidental expense thereto shall be borne by the Contractor regardless of the result of the tests. The Contractor shall take down or cut out and reconstruct the defective work or shall make the remedial measures as instructed at his own cost. If the load testing is instructed on any ground other than mentioned in a) to g) of Clause 1.1.20.1 above, then the cost of the same shall be reimbursed to the Contractor if the result of the test is found to be satisfactory.

1.20.6 In addition to the above load tests, the Contractor at his own expense, if so, required by the COR, shall carry out non-destructive test methods such as core test and ultrasonic pulse velocity test. Such tests shall be carried out by an agency approved by the COR and shall be done using only recommended testing equipment. The acceptance criteria for these tests shall be as specified by the agency or good Engineering practice and as approved by the COR.

1.21. Preliminary Work:

1.21.1 Survey Work

The said work involves at the very start of work taking-over of reference point from the COR, establishment of control points, triangulation points, bench marks, grid layout for all the piers and other structures maintaining horizontal and vertical control within the permissible limits, incorporating changes (if any), submission of full data in the tabulation form and survey drawings. Costs towards all of the above shall be deemed included in the Contractor's rates.

1.3 Structural Work:

1.3.1 Minimum cement content specified in CPWD specification 2009 is purely from durability point of view. The minimum cement contents for different concrete grades shall be as described under items in BOQ, drawings, relevant codes and Section 3 of this document. Larger content of cement shall have to be provided if demanded by mix design.

1.3.2 Provision of cement slurry to create bond between plain / reinforced concrete surface and subsequent applied finishes (floor, plaster, dado, skirting, etc.) shall not be paid extra.

1.3.3 Mix design using smaller aggregates of 10mm down, shall also be done in advance for the use in the junction having congested reinforcement.

1.3.4 Procedure of mixing the admixtures shall be strictly as per the manufacturer's recommendations, if not otherwise directed by the COR.

1.3.5 All the water tanks and other liquid retaining concrete structures shall undergo hydro-testing.

1.4 Architectural and Finishing Work:

1.4.1 The Contractor shall incorporate seismic considerations of anchoring and isolation in the design and detailing of the finishes as directed by the COR. The element to be anchored shall have its motion suitably restrained while at the same time it shall be suitably isolated so as not to be affected by the deformations/ vibrations of the building during Construction.

1.4.2 Sub-Contractor:

Works as listed below and those dealing with proprietary materials/ products may be carried out by the Contractor through the Sub-Contractors, as may be approved by the COR in writing. The Sub-Contractors must be firms of repute and long standing, having adequate experience and complete facilities to carry out all items of work required for completion as per Specifications and expected quality to the satisfaction of the COR. The Sub-Contractor must also have personnel experienced in preparing shop drawings. All such works shall be carried out under the direct supervision of the manufacturers of the proprietary materials/ products or their trained and accredited licensee.

- a) Structural Steel work
- b) Waterproofing
- c) Seismic Joints
- d) Painting and Polishing (where proprietary product or material or a specialised process/ technique is required)
- e) Electrical Works (Internal or External)
- f) HVAC Works
- g) Any other Trade required as/ specs. after prior approval.

1.4.3 Guarantees and Building Maintenance for Finishes:

The Contractor shall guarantee and undertake to maintain and rectify the various components of the Civil Works for their successful performance for the periods as specified below. The Contractor shall indemnify the COR for a similar period against any damage to property and injury to persons on account of any defective work or maintenance carried out by the Contractor. The format and text of the Guarantee and the Indemnity Bond shall be as followed in CPWD or as approved by the COR. Waterproofing shall be guaranteed for 10 years unless otherwise specified in the BOQ's.

1.4.4 Responsibility for Shop drawings, Samples and Mock-ups:

Approval of shop drawings, samples and mock-ups for the various components shall not absolve the Contractor of his responsibility of completing the work to the specifications, standards, tests for performance and guarantees given in these documents and to a quality of finish as desired by the COR.

1.4.5 Cleaning:

Surfaces on which finishes are to be provided shall be cleaned with water jets or oil free compressed air or power tools with wire brushes and detergents all as approved by the COR.

1.4.6 Expansion bolts/ fasteners:

1. Unless specified otherwise all expansion bolts/ fasteners shall be fabricated from austenitic stainless-steel sheet, strip or plate conforming to ASTM A 240 Gr 304 or bar to ASTM A 479 Gr 304 of approved make and design. The material of the bolt shall not cause any bimetallic corrosion with the reinforcing bars of the RCC/ brickwork or with any other fixings or doors or windows or skylights etc.
2. For steel backings the fasteners shall be prevented from contact with other metals, which would lead to bimetallic corrosion.
3. For brick masonry backing, the sleeves of the expansion bolts shall be fixed in wedge shaped pockets having an area of 75mm X 75mm at the surface and 100mm X 100mm at the inner surface and shall be 125mm deep. The wedge could also be as a truncated cone of 75mm dia/ 100mm dia. The COR shall review the dimensions during execution of the work. The wedge shall be filled with PCC 1:1:2 (1 Cement: 1 Sand; 2 Coarse Aggregate) mixed with non-Shrink Compound in the proportion as recommended by the manufacturer.
4. The holes drilled for the expansion fasteners shall be cleaned of all ground material, dust, etc. before inserting the expansion sleeves.



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5. All expansion bolts fixed into soffits shall be bonded to the backing with epoxy/ polyester resin of approved make.
6. All expansion bolt fixings shall be tightened in accordance with the recommended torque figures of the manufacturer. Where such values are not available the Contractor shall test at least 6 samples to determine the safe torque values. All bolts shall be tightened using torque spanner/ wrenches. All bolts shall be checked 24 hours (minimum) after installation and retightened if necessary.
- 1.4.7 No walls/ terraces shall be cut for making any opening where water proofing has been done without written approval of the COR. Cutting of waterproofing when authorised by the COR in writing shall be done very carefully so that no other portion of the waterproofing is damaged. On completion of the work at such places, the water proofing membrane shall be made good and ensured that the opening/ cutting is made fully water proof as per specifications and details of water proofing approved by the COR at no extra cost. No structural member shall be cut or chased without the written permission of the COR.
- 1.4.8 Provision of grooves in plaster, drip courses etc., if directed, at junction of walls-ceilings, columns-walls, frames-plaster and such other generally typical locations shall not be paid extra, including grooves in concrete, masonry, stonework unless otherwise specified in BOQ.
- 1.5 **Applicable Codes, Standards & Publications for Structural & Architectural Work:**
The more important Codes, Standards and Publications to Contract are listed as Annexure 'B' annexed herewith.

SECTION – S.02 STRUCTURAL STEEL WORKS

- 6.1 These specifications shall be read in conjunction with the CPWD specifications 2009 and other relevant reference specifications described in the section 1 of these specifications.

The Contractor will provide all materials and equipment required to complete the works in every respect, whether such materials are required as part of the permanent structures or temporary for fabrication or erection or maintenance including specifically structural steel plates, flats, bars, welding rods, rivets, bolts and nuts, paint, welding sets in the shop and at Site, all workshop facilities, derricks, cranes, pulley blocks, wire ropes, hemp or manila ropes, winches, erection cleats and temporary braces or supports and all other materials required to deliver the Works complete in every respect.

All labour required for fabrication and erection for any cleaning, making good, rectifying, hauling, and painting and for any other ancillary work required to complete fabrication and erection.

The Contractor shall observe all safety requirements for erection of structural steelwork as covered in IS: 7205.

6.2 Drawings:

- 1 The Contractor is to prepare all the necessary fabrication shop drawings and these shall be submitted to the COR in duplicate and be approved by him before fabrication is commenced. All such drawings shall show the dimensions of all parts, method of construction, welding and bolting. Further sets of all approved fabrication drawings shall be supplied by the Contractor for use of the COR, as required. The Contractor shall at his own expense supply such additional copies of his working drawings as are required for the use of the interested parties.
- 2 Approval by the COR of drawings or any other particulars submitted by the Contractor shall not relieve the Contractor of full responsibility for any discrepancies, errors or omissions therein.

6.3 Material:

- 1 **Structural Steel:** All structural steel shall be of tested quality and shall conform to one of the following standards:
 - IS: 226 Structural steel (Standard Quality)
 - IS: 2062 Structural steel (Fusion welding quality)
 - IS: 961 High Tensile Structural Steel (Ordinary)
 - IS: 1161 Steel Tubes for Structural purposes
 - IS: 4923 Hollow Steel Sections for Structural use

The Contractor shall supply to the COR copies of the manufacturer certificate that the steel brought to the Site for incorporation in the works is of a quality fully complying with the specification. If required by the COR, the Contractor shall arrange for testing of the steel samples as per IS: 1608 - 1599.

- 2 **Welding Electrodes:** Welding electrodes used for the works shall conform to IS: 814/latest and shall be supplied by manufacturer approved by the COR and shall be of the grade approved by the COR. All Electrodes shall be kept under dry conditions. Any electrode which has part of its flux coating broken away or is damaged shall be rejected.
- 3 **Bolts and Nuts:** Bolts and nuts used for the works shall unless otherwise specified be black bolts and nuts supplied by manufacturer approved by the COR and shall conform to IS: 1367.

For the truss hot-dip galvanized (@ 300gm/sqm) bolt sleeve of mild steel grade 'B' conforming to IS: 2062 and 4 dia 12mm anchor bars welded to same as per detailed drawing and instruction of the COR shall be provided. The length and diameter of sleeve shall be 300mm and 60mm respectively. The sleeve shall receive hexagon head bolt IS: 1363 (part –I) –ISO 4016-M20X90-8.8.

Hexagon head bolt shall be provided with galvanized spring washer as per the detailed drawing and instruction of the COR.

- 4 **Washers:** Plain washers shall be made of mild steel conforming to IS: 5369 (1975), unless otherwise specified. One washer shall be supplied with each bolt and, in case of special types of bolts, more than one washer as needed for the purpose shall be supplied. An additional double coil helical spring washer, conforming to IS: 6755 (1980) shall be provided for bolts carrying dynamic or fluctuating loads and those in direct tension. Tapered washers, conforming to IS: 5372 (1975) and IS: 5374 (1975), shall be used for channels and beams respectively wherever required.
- 5 For all other material required for the works, the approval of the COR shall be obtained by the Contractor prior to the use of the material in the works.

6.4 Workmanship and Fabrication:

- 1 For all the works, workmanship shall be of first-class quality, throughout, in conformity with IS: 800-latest, and true to line, level and dimension as shown in the drawings or instructed by the COR.
- 2 All parts assembled for bolting shall be in close contact over the whole surface and all bearing stiffeners shall bear tightly at top and bottom without being drawn or caulked. The component parts shall be so assembled that they are neither twisted nor otherwise damaged, as specified cambers if any shall be provided. Drilling done during assembling shall not distort the metal or enlarge holes. The butting surfaces at all joints shall be so cut and milled so as to butt in close contact throughout the finished joints.
- 3 Cutting shall be done automatically. Hand flame cutting will not be permitted.
- 4 The edges and ends of all cut/sheared flange plates, web plates of plate girders, and all cover plates, and the ends of all angles, tees, channels and other sections forming the flanges of plate girders, shall be planed/ground.
- 5 Holes for bolts shall be drilled to conform to clause 10 of IS: 7215 (1974). Punching of holes will not be permitted. All drilling shall be free from burrs. No holes shall be made by gas cutting process.
- 6 All welding for the works shall be carried out by first class welders and shall be in accordance with IS: 816, IS: 819, IS: 1024, IS: 1261, IS: 1323 and IS: 9595. The COR may at his discretion order periodic tests of the welder and/or of the welds produced by them. The Contractor at his cost shall carry out all such tests.

Safety requirements should conform to IS: 7205, IS: 7273 and IS: 7269 as applicable and should conform to safety, economy and rapidity.

- 7 **As much work as possible shall be welded in shops.** The pieces shall be manipulated to ensure down hand welding for all shop joints as far as possible. All parts to be welded shall be arranged so as to fit properly on assembly. After assembly and before the general welding is to commence the parts are to be tack welded with small fillet or butt-welds as the case may be. The tack welding must be strong enough to hold the parts together but small enough to be covered by the general welding. The welding procedure shall be so arranged that the distortion and shrinkage stresses are reducing to a minimum.
- 8 All joints required in structure to facilitate transport or erection should be shown on the drawings or as specified by the COR. Should the Contractor need to provide joints in locations other than those specified by the COR he should submit his proposals and obtain the prior sanction of the COR for such joints. The lengths of structural shall be the maximum normally available in the market jointing of shorter length in order to make up lengths required shall not be permitted.
- 9 Each piece of steel work shall be marked distinctly before delivery, indicating the position and direction in which it is to be fixed. Three copies of complete marking plan are to be supplied to the COR before erection commences.

- 10 In the case of welded fabrication any distortion remaining in the member after welding operations are completed shall be rectified by and/or at the expense of the Contractor to the approval of the COR.
- 11 All members of trusses and lattice girders shall be straight throughout their length, unless shown otherwise on the drawings, and shall be accurately set to the lines shown on the drawings. Sheared edges of gussets or other members are to be straightened and dressed where necessary.
- 12 Templates and jigs used throughout the work shall be all steel. In cases where actual materials have been used as templates for drilling similar pieces, the COR shall decide whether they are fit to be used as parts of the finished structure.
13. Apart from the requirements of welding specified under the above sub clauses, sections above, the Contractor shall ensure the following requirements in the welded joints.

Strength-quality with parent metal.

Absence of defects

Corrosion resistance of the weld shall not be less than that of parent material in an aggressive environment.

14. No gasket or other flexible material shall be placed between the holes. The holes in parts to be joined shall be sufficiently well aligned to permit bolts to be freely placed in position. Driving of bolts is not permitted. The nuts shall be placed so that the identification marks are clearly visible after tightening. Nuts and bolts shall always be tightened in a staggered pattern and, where there are more than four bolts in any one joint, they shall be tightened from the centre of the joint outwards.

6.5 **Testing of Welds:**

Butt welds Radiographic testing of 5% of welds as per IS: 1182.

Fillet welds Ultrasonic testing of 5% of welds.

All welded connections shall be inspected as per IS: 822

All welds shall be tested by "dye penetration test" as per current practices.

Agency for testing of weld shall be approved by the COR prior to testing.

Defective welds shall be repaired or replaced as decided by the COR. The repaired or replaced welds shall be tested using the same methods as above. Additionally, when defective welds are found, the cause of the defective welding shall be determined and the Contractor shall institute immediate corrective action.

No extra payment shall be made for the tests indicated above.

6.6 **Protection of Steel Works (IS: 8629):**

- 1 Sand blasting where specified shall be carried out in accordance with IS: 1477.
- 2 Painting work shall be carried out in accordance with IS: 8629 (Parts I to III). Painting shall be applied under the temperature requirement specified by the manufacturer.
- 3 The steel work, prior to delivery, shall be cleaned from scale, rust, dirt and grease etc., by means of chipping, scraping and wire brushing using skilled operators as described in the painting systems below. The cleaning shall proceed each day over the extent of surfaces, which can be painted on that day. The paint shall be applied by brushing or spraying as per approval of the COR.

Paint brushes round/oval and flat shall be conforming to IS: 487 and IS: 384 codes respectively, if painting with brushes is approved by COR.

The spraying equipment shall be compatible with the paint material, fitted with necessary gauges and controls and approved by the COR.
- 4 Site weld locations shall be left free from paint within 50mm of the weld position, and contact surfaces in connection using High Strength Friction Grip Bolts shall not be painted. Immediately

after completion of erection all damaged paint shall be scraped off and made good to the approval of the COR.

The Steelwork specialist shall also clean down and apply one coat of primer to all Site bolts, Site bolted connections and Site weld locations and the paint work generally shall be left in sound condition for any subsequent painting.

- 5 All paints and primers shall be of best quality and in original sealed containers as packed by the paint manufacturer conforming to the relevant Indian Standards and shall be procured directly from the manufacturers. All paint to be used shall be stored under cover in such conditions as will preserve it from extreme of temperature and the paint shall be used and applied strictly in accordance with the manufacturer's instructions.

- 6 In addition, the following specification shall apply to the shop painting of contact and inaccessible surfaces:

Surfaces to be painted shall be thoroughly cleaned from scale, rust, dirt, grease etc. by means of sand/grit/shot blasting or other equivalent means.

Surfaces, which are to be brought permanently into close contact or made inaccessible either in the shops or upon erection shall, after cleaning, be given two coats of Red Lead Priming Paint. The surfaces shall be brought into contact while the paint is still wet.

Contract surfaces in connection using High Strength Friction Grip bolts shall not be painted or oiled and shall be free from dirt, loosed scale, burrs, pits and any other defects which would prevent the solid seating of the parts and would interfere with the development of friction between them.

All enclosed surfaces of box members shall be completely sealed by oiling or by coating with approved bitumen paint and all such members and tubes shall have their ends closed by suitable plates welded in position.

- 7 Surfaces in contact during shop assembly shall not be painted. Surfaces which cannot be painted, but require protection, shall be given a rust inhibitive grease conforming to IS: 958 (1975), or solvent deposited compound conforming to IS: 1153 (1975) or IS: 1674 (1960), or treated as specified in the drawings.
- 8 Surfaces to be in contact with concrete shall not be painted.
- 9 The Contractor shall take all precautions to prevent dust and dirt coming in contact with freshly painted surfaces or with surface being painted. The second coat of paint shall only be applied when the first coat has dried.
- 10 Surfaces not in contact but inaccessible after shop assembly shall receive the specified protective treatments before assembly.
- 11 Exposed machined surfaces shall be adequately protected.
- 12 A uniform film thickness of paint is to be ensured throughout the work.
- 13 Surfaces, which have not been shop coated, but require surface treatment shall be given necessary surface preparation and coats at Site as specified in the painting system.
- 14 The painting system to be used shall be as under:

Note:

- DFT = Dry Film Thickness
- The application rate of paints shall be for reference only, and the Contractor shall decide such rates accordingly to the definitive paints selected by him for ensuring the specified DFT in Table below:

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Item Description	Stages			
	Fabrication		Erection	
	General Surfaces	Joint Connection	General Surfaces	Joint Connection
Structural Steel work using Rolled steel section / welded built-up section, open web truss and framed work	1.Surface Treatment SIS SA 2.5 Near - white blast cleaning	(N.A.)	(N.A.)	1) Surface Treatment SIS ST3 Power Tool cleaning
	2. Primer - Inorganic Zinc Rich Shop Primer DFT (15 μ m) (200 g/m ²)	(N.A.)	(N.A.)	2) 1 st under coat Epoxy Zinc Phosphate Primer Polyamide cured DFT: 35pm
	3. 1 st under Coat – Inorganic Zinc Silicate Primer (Self curing solvent type) DFT: 75 μ m	(N.A.)	(N.A.)	3) 2 nd Under Coat Epoxy Zinc Phosphate Primer Polyamide cured DFT 35pm
	4. 2 nd Under -Coat Epoxy Zinc Phosphate Primer Polyamide cured DFT: 35 μ m	(N.A.)	(N.A.)	4) 3 rd Under Coat Epoxy High Build Micaceous Iron Oxide coating Polyamide cured DFT: 90pm
	5. 3 rd Under-Coat Epoxy Zinc Phosphate Primer Polyamide cured DFT: 35 μ m	(N.A.)	(N.A.)	5) 4 TH Under Coat Epoxy High Build Polyamide Finish DFT: 100pm
	6. 4 th Under-Coat – Epoxy High Build Micaceous Iron Oxide Coating Polyamide cured DFT: 90 μ m	(N.A.)	Intermediate Coat – Acrylic Poly Urethane Finish Aliphatic Isocyanate cured DFT: 30 pm	6) Intermediate Coat – Acrylic Poly Urethane Finish Aliphatic Isocyanate cured DFT: 30 PM

6.7 Erection & Site Work:

1. The Contractor shall be responsible for checking the alignment and level of foundation and correctness of foundation bolt centres, well in advance of starting erection work, and shall be responsible for any consequences for non-compliance thereof. Discrepancies, if any, shall immediately be brought to the notice of the COR for his advice.
 - The structure should be divided into erectable modules as per the total scheme. This should be pre-assembled in a suitable yard/ platform and it's matching with members of the adjacent module checked by trial assembly before erection.
 - Immediately prior to erection any rust in the paint area shall be removed by power wire brushing to a standard equivalent to SA3.
- 2 During erection the rough handling of fabricated materials such as bending, straining or pounding with sledges shall be avoided. The Contractor at his own cost shall immediately rectify any damage to the structure during transportation or erection. The straightening of bend edges of plates, angles and other sections shall be done by methods, which will not cause fracture.
 - Following the completion of the straightening, the surface of the member shall carefully be inspected for damage and got approved by the COR before further use.
- 3 The Contractor shall be responsible for accurately positioning, levelling and plumb aligning of all steelwork and placing of every part of the structure in accordance with the approved drawings and to the satisfaction of the COR. All stanchion base, beam and girder bearings etc. shall be securely supported on suitable steel packs. All reference and datum points shall be fixed near the work Site for facilitating the erection work.
- 4 All equipment used by the Contractor shall be sufficient for the purpose and for the erection of the steel work, in the time specified in the Contract. Any lifting or erecting machinery shall be to the approval of the COR and shall be removed from the Site if he considers such appliances dangerous or unsuitable for their functions. The approval of the COR shall not relieve the Contractor of the responsibilities for the loads to which the erection equipment shall be called upon to carry. Adequate arrangement shall be made to resist wind loads and lateral forces arising at the time of erection.
- 5 The Contractor is entirely responsible for the stability of the structure during erection and shall arrange that sufficient tack bolts, braces or guy ropes are used to ensure that work will remain rigid until final bolting, riveting or welding is completed. The Contractor shall supply and fix, without extra charge, any temporary bracing which may be necessary.
- 6 All steelwork shall be erected in the exact position as shown on the drawings. All vertical members shall be truly vertical throughout and all horizontal members truly horizontal, fabrication being such that all parts can be accurately assembled and erected. No permanent bolting, welding or grouting shall be done until proper alignment has been obtained and checked by the COR.
- 7 At stanchion splices and at other positions where concrete cover to the steel is liable to be restricted, bolts will be placed with their heads on the outside of the members.
- 8 All field assembly bolting and welding shall be executed in accordance with the requirements for shop fabrication excepting such as manifestly apply to shop conditions only. Where steel has been delivered painted the paint shall be removed before field welding for a distance of at least 50mm on either side of the joints. The number of washers on permanent bolts shall not be more than two for the nut and one for the bolt head.

6.8 Rectification of damaged materials:

Any error in shop work which prevents the proper assembly and lifting up of the parts by moderate use of drift pins or reaming or cutting shall be immediately reported to the COR and his approval of the method of rectification obtained in writing. Wrongly fabricated material whose erection in the field necessitates extra work shall be the responsibility of the Contractor. The entire costs of such

operation including the replacement of defective members, if required, shall be borne by the Contractor.

6.9 Inspection:

- 1 The Contractor shall inform the COR of the progress in fabrication and as to when individual pieces are ready for inspection. The Contractor shall supply all gauge templates necessary to satisfy the COR. The COR may at his discretion check the results obtained at the Contractor's works by independent tests and should the material so tested be found unsatisfactory, the cost of such tests shall be borne by the Contractor.
- 2 Structural steel and components viz. bolts, nuts, washers, welding consumables, etc. should be tested for mechanical and chemical properties as per the requirement of the relevant IS or any other specified codes/standard.
- 3 During Inspection, the component/member shall not have any load or external restraint.

6.10 Grouting of steel bases:

- 1 Before grouting of stanchion bases, the Contractor shall take the following action:
 - a) Inform the COR.
 - b) Clean all holes, openings, recesses and the top of foundations of all dirt, mud, water, oil or other extraneous matter.
 - c) A frame shall be placed in position around the base plate with a provision for placing or injecting grout.
 - d) The Contractor shall provide screed bars or mild steel flats and fix them in mortar.
 - e) Holes shall be provided on the stanchion bases for escape of air.
- 2 Grouting of steel beams, steel stanchions, bases and bearings and encasement of steelwork will be carried out by the Contractor after the steelwork has been finally aligned and levelled and approval of the COR obtained.
- 3 The bolt sleeves shall be grouted as a separate operation using neat cement grout of a creamy consistency, which shall be poured in so as to completely fill the holes. "Non-shrink" cements, additives of approved makes shall be used for all grouting operations.
- 4 The space between the top of the foundations and the underside of the base plate shall be completely filled with a mix 1:2 cement sand mortar and finished flush with edge of the base plate, either:
 - a) Mixed as a stiff mortar well rammed into place from all sides.
 - b) Mixed as thickly as possible consistent with fluidity and poured under a suitable head and tamped until the space has been properly filled.

6.11 Grouting of Base Plates & Boltholes:

i Mixing :

Dry grout should be mixed in a mechanical mixer: the conventional 200/400-litre capacity concrete mixer can be used to mix four bags of dry grout; alternatively, paddle type mortar mixers can be used. The quantity of grout to be mixed at one time should not exceed that amount which can be placed in approximately 10 to 15 minutes.

ii Batching :

Batching of grout by fraction of a bag is not allowed. The quantity of mixing water should be the minimum commensurate with workability, compaction, and filling of the grout in all corners and crevices. Mixing should be done for a minimum of three minutes to obtain a fluid grout of uniform consistency.

iii Cleaning And Preparation Of The Surface :

The base concrete should be clean and strong, and its surface should be properly hacked; all dust should be removed suction or compressed air. The surface should be thoroughly wetted with water for several hours. Before the grout is poured, all free water should be removed and the flat surfaces coated with thin cement slurry.

iv **Restraint :**

Heavy back-up blocks of timber or concrete should be fixed on all sides of the base plate to prevent escape of the grout, when poured through the openings provided in the base plate. Adequate restraint must be ensured on all the sides for a period of 7 days to obtain effective expansion and shrinkage compensation.

v **Curing :**

The grout should not dry out where external restraint is provided in the form of formwork, the top opening and all stray openings should be covered with wet sack for at least 7 days.

vi **Placing And Compaction :**

The grout should be placed quickly and continuously either through the holes in the base plates or from one side only to ensure complete filling without entrapment of air. Grout should be properly spread and compacted by rodding. Excessive vibration should be avoided.

Below the bedplates the grout should be compacted using long pieces of doubled-over flexible steel strapping or chains. The forward and backward movement of the strap or chain will assist in the flow of the grout into place. Steps must be taken to keep the grout in full contact with the underside of the bedplate until the grout sets maintaining a small head of fresh grout in the forms.

vii **Shrinkage Compensated Grout:**

Shrinkage compensated grout of associated cement companies limited or any other approved manufacturer (Fosroc, Roffe, Sika, BASF) should be used. The batching shall be as per the manufacturer's specifications, other procedures being as above.

6.12 **Holding down and Anchor bolts:**

- 1 The holding down and anchor bolts should conform to the requirements laid down in IS: 5624 or as directed by the COR.
- 2 **Installation:** Individual bolts in groups of holding down bolts shall be positioned accurately within a tolerance of +6mm. The bolts shall be set vertically to a tolerance of not more than 1 in 250.
- 3 During the casting of concrete the Contractor shall ensure that space between the bolt and sleeves is kept clean after removal of shuttering. The Contractor shall provide and fix timber plugs to maintain this space in a clean condition. Approved wrapping materials shall protect the projecting threads of bolts.
- 4 Grouting of bolt tubes shall be carried out after the steelwork or equipment have been aligned, plumbed and levelled.

6.13 **Tolerances:**

- 1 All tolerances shall be in accordance with IS: 7215 unless otherwise specified.
- 2 The maximum deviation for line and level shall be + 3.0mm for any part of the structure including for location of column centres.
- 3 The maximum deviation from plumb for columns shall be +3.0mm in 10.0m height subject to a maximum of +6.0mm in a total height of 30.0m.
- 4 The deviation at the centre of the upper chord member from vertical plane running through the centre of the bottom chord shall not be more than 1/1500 of span but in no case more than 10.0mm. The lateral displacement of top chord at centre of span from vertical plane running through centre of supports shall not be more than 1/250 of the depth of truss but in no case more than 20.0mm.

6.14 **Note:**



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- 1 The pricing must include for all rolling margins, extras for length and size, allowance for waste, complete fabrication, delivery and erection, and caulking the gap between base plate and foundation, and painting as specified in the item.
- 2 Any temporary strutting, tying or anchor bolts, black bolts, fasteners, welding required to withstand the stresses of erection and carrying of plant are to be included in the price.
- 3 All necessary foundation, holding down and /or anchor bolt assemblies etc. including their nuts and washers, temporary structural work required for erection purposes etc. are to be included in the price.



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SECTION – S.03 HVAC SYSTEM DESIGN DATA

1. GENERAL

- 1.1. The system design, basis of design, estimated requirements and other relevant data are outlined in this section. The detailed specifications and specific requirements are outlined in the subsequent sections

2. LOCATION

- 2.1 US Embassy, New Delhi.

3. SCOPE OF WORK

- 3.1 The work proposed under this tender includes providing and fixing Air-Cooled Split Hi-wall Air conditioners, Refrigerant piping, drain piping, insulation, electrical wiring/panel/machine connection etc. for the above project.

4. SYSTEM DESIGN

- 4.1 Areas shall be provided with Hi wall type units.
- 4.2 The Outdoor condensing units of Ductable & Hi Wall units shall be placed on terrace or balcony of the rooms.
- 4.3 The Outdoor & Indoor units shall be interconnected with copper refrigerant piping duly Insulated.
- 4.4 Provision of 220 v / 1 PH / 50 Hz electric supply up to each Hi wall Indoor & Outdoor unit.

5. DRAWINGS

Tender drawings are diagrammatic only and indicate arrangement of system and the extent of work covered in the contract. These drawings indicate point of supply and point of termination and suggest the route to be followed. The architectural drawings and details shall be examined for exact location of equipment, cut-outs etc. Contractor shall follow the tender drawings in preparation of shop drawings and for subsequent installation work and will coordinate with other services also.

6. TEST DATA

The whole system shall be tested as per specifications given elsewhere and complete test data shall be furnished on prescribed data sheet.

7. DEVIATION FROM SPECIFICATIONS

Deviation from specifications may be accepted, provided such deviations are found necessary and appropriate, in order to meet the design of established foreign collaborators/manufacturers.

8. COMPLETENESS OF ITEMS

The prices of each equipment shall include the cost of all accessories or miscellaneous items listed in the respective section, except for the items where “Price Separately” is indicated. The item shall be complete regardless of whether or not it is listed in the BOQ.

9. TECHNICAL DATA



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Each Tenderer's must submit along with the tender the technical data for all items listed herein in the indicated format. Failure to furnish technical data with tenders may result in summary rejection of the tender.

10. PERFORMANCE GUARANTEE

- 10.1 The contractor shall guarantee that the air conditioning system shall maintain the design inside temperature within $\pm 1^{\circ}$ C tolerance and the relative humidity shall not exceed the specified limit.
- 10.2 The contractor shall guarantee that the capacity of various components as well as the whole system shall not be less than specified.
- 10.3 The contractor shall ensure that the system shall be free of all objectionable vibrations and disturbing sounds under all conditions of operation.

11. CODES & STANDARDS

THE SPLIT SYSTEM SHALL CONFORM TO THE LATEST EDITION OF FOLLOWING STANDARDS: -

ASHRAE 15	Safety code for Mechanical refrigeration
ASHRAE 23	Methods of testing and rating positive displacement refrigerant compressors and condensing units
ANSI B 31.5	Code for refrigeration piping
ARI 575	Standard for method of measuring machinery sound within an equipment space
ISO 1940	Mechanical vibration – Balance quality requirements of rigid rotors
ISO 10816-1	Mechanical vibration – Evaluation of machine vibration of measurements on non-rotating parts. General guidelines



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SECTION – S.04 SPLIT SYSTEM

1. GENERAL

- 1.1 Air cooled split units shall be as per approved make, inverter type energy efficient Scroll compressor complete with vibration isolators and factory installed controls (like HP & LP cutouts, inter locking fan & compressor, thermostat with selector switch etc.), & accessories including wiring.

2. INDOOR COOLING UNIT

- 2.1 Efficient cooling coil shall be selected for low velocity with required OD copper tubing having extended aluminum fins. The fins shall be bonded to tube using Hydraulic expansion of tubes to ensure tight bonding between tubes and fins for high heat transfer.
- 2.2 Tubes shall be arranged in staggered design for best air contact thus giving low bypass.
- 2.3 The cooling coil circuits shall be complete with an expansion valve and a distributor.
- 2.4 Ductable units shall be hanged with the ceiling.
- 2.5 Blower of evaporating unit shall be statically and dynamically balanced and shall be selected to give required air flow.
- 2.6 Filters shall be removable synthetic washable type.
- 2.7 Drain pipe shall be insulated with expanded polyethylene foam.

3 AIR COOLED CONDENSER

- 3.1 Remote air-cooled condensing unit shall have efficient condenser coils made out of copper tubing with extended aluminum fins.
- 3.2 Tubes shall be arranged in a staggered design for better efficiency.
- 3.3 Condenser fans shall be selected to operate quietly for required CFM to keep condensing temperature low.
- 3.4 The condensing unit shall be installed with MS base frame with neoprene rubber pads.

4. MISCELLANEOUS

- 4.1 Interconnected refrigerant piping between outdoor unit and indoor unit shall be of heavy gauge copper complete with insulation.
- 4.2 The units shall be tested in accordance with IS 1392.
- 4.3 The power supply shall be provided at outdoor/indoor unit as per manufacturer's requirement.

SECTION – S.05 REFRIGERANT & DRAIN PIPING

1. REFRIGERANT PIPING

- 1.1 All refrigerant piping for the air conditioning system shall be constructed from hard drawn seamless copper refrigerant pipes with copper fittings and silver-soldered joints. The refrigerant piping arrangements shall be in accordance with good practice within the air conditioning industry, and are to include charging connections, suction and liquid line insulation and all other items normally forming part of proper refrigerant circuits.
- 1.2 The suction line pipe size and the liquid line pipe size shall be selected according to the manufacturer's specified outside diameter. All refrigerant pipes shall be properly supported and anchored to the building structure using steel hangers, anchors, brackets and supports which shall be fixed to the building structure by means of inserts or expansion shields of adequate size and number to support the load imposed thereon.

2. DRAIN PIPING

- 2.1 The indoor units shall be connected to drain pipe made of rigid heavy-duty PVC of minimum 20 mm dia.
- 2.2 The pipes shall be laid in proper slope for efficient drainage of condensate water.

3. REFRIGERANT PIPE INSULATION

- 3.1 The whole of the liquid and suction refrigerant lines including all fittings etc. shall be insulated with 12 mm thick sleeve of Nitrile rubber/polyethylene foam insulation having K value 0.027 W/m k at mean temperature of 10°C and minimum density of 26 kg./m³.
- 3.2 The joints shall be properly sealed with rubber-based adhesive to ensure proper bonding of the ends.

4. DRAIN PIPE INSULATION

- 4.1 Drain pipe carrying condensate water shall be insulated with 6 mm thick sleeve of Nitrile rubber/polyethylene foam insulation having K value 0.027 w/m k at a mean temp. of 10° C at min. density of 26 k/m³.
- 4.2 Insulation on drain pipe shall be carried out where the pipe is running within the wall. Exposed pipe shall be without insulation
- 4.3 The insulation joint shall be properly sealed with rubber-based adhesive to ensure proper bonding of the ends.

5. PRESSURE TESTING OF REFRIGERANT PIPES

- 5.1 All refrigerant pipes to be embedded in the wall shall be nitrogen pressure tested up to 300 PSI for at least 48 hrs. Before. Closing/repairing of the chased wall.
- 5.2 All refrigerant pipes after pressure testing shall be closed at both the end for future use.

SECTION – S.06 ELECTRICAL PANELS

1. GENERAL

The Electrical power system should confirm to relevant I.S. standard. A main incoming MCB/MCCB of suitable rating and having required capacity for each Hi wall unit/Machines should be provided on the unit sized to meet the total power requirements for Hi wall unit/Machines

- 1.1 Within the panel individual power loads should be distributed equally across the three phases.
- 1.2 All individual wires should be of copper and colour coded or should be numbered at their point of termination to facilitate servicing.
- 1.3 Low voltage control wiring and power wiring should be segregated from each other.
- 1.4 Heaters shall be suitably provided with insulators with safety thermostats and contactors of suitable ratings.
- 1.5 The following shall be incorporated: -
 - i.) MCB of suitable rating and having a rupturing capacity of 10 KA should be provided for each sub-circuit.
 - ii.) Contactors for motors of suitable rating.
 - iii.) Electronic overload protection against overload, phase loss & reverse phase sequence and sensing negative sequence current for individual 3 phase motors.

2. CONTROLS

Following controls should be provided: -

- i.) High pressure trip – Manual reset (for each compressor)
- ii.) Low pressure trip – Auto reset (for each compressor)
- iii.) The thermostat & humidistat to control operation of the unit.

3. SAFETY INTERLOCKS

- 3.1 Interlock between condenser fan motor and compressor motor to prevent starting of compressor without condenser fan in operation.
- 3.2 Condenser fan should stop along with compressor.
- 3.3 Provision should also be made to operate the evaporator fan without, the operation of condenser and compressor.
- 3.4 TIME DELAY of minimum three minutes shall be there for restart of compressor.

4 PANELS

The contractor shall consider the following details in their scope of works no additional cost shall be paid, wherever required:

- Pad locking of Switch board doors.
- Pad locking of MCCB's handles in "OFF" Position.
- All MCB's used for protection of resistive and lightly inductive load shall be type "B" characteristic and inductive (motor) load shall be of type "C" characteristic and discharge lamps and UPS etc. shall be of type D characteristic.
- All PTs / control transformer shall be provided with center tap earth secondary.
- The Panel fabricator shall provide Al./ Copper Bus-bars link from Breakers wherever more than two nos. of cables are terminated in the breakers.

The drawings, specification and BOQ complement each other and which is shown or called for one shall be interpreted as being called for on both.

CODES & STANDARDS

The design, manufacture and performance of equipment shall comply with all the currently applicable statutes, safety codes, relevant Bureau of Indian Standards (BIS), British Standards (B.S.), International Technical Commission (IEC) Publication, NEMA, IDE & DEMA standard as amended up to date.

- | | | |
|----|-----------|--|
| a) | IS: 13947 | 1993/IEC 60947-1989: Air circuit breaker/moulded case circuit breaker. |
| b) | IS:3156 | Voltage transformers. |
| c) | IS:2705 | Current transformers for metering and protection with classification Part-I, II burden and insulation & III 1964 |
| d) | IS:9224 | Low voltage fuse and protection. |
| e) | IS:3231 | Specification for electrical relays for power system protection. |
| f) | IS:8623 | Specification for factory-built assemblies of switchgear and control gear for voltage up to and including 1000-V AC/1200 V-DC. |
| g) | IS:4237 | General requirements for switch gear and control gear for voltage not exceeding gear. |
| h) | IS:2147 | Degree of protection provided by enclosures for low voltage switch gear and control gear. |
| i) | IS:1018 | Switchgear and control gear selection/installation and maintenance. |
| j) | IS:1248 | Direct acting electrical indicating instruments. |
| k) | IS:5578 | Guide for marking of insulated conductors. |
| l) | IS:11050 | Guide for forming system of marking and identification of conductors & apparatus terminal. |
| m) | IS:1248 | Direct acting indicating analogue electrical measuring instruments and Testing accessories. |

The board shall be metal enclosed single front, indoor, floor mounted, free standing type or wall mounting type as mentioned in BOQ. The panel shall be designed for a degree of protection of IP-52. Keeping in view the operating height of the top switch 1750mm from finish floor. 400mm clear space shall be left throughout the panel at bottom. The cold rolled sheet steel will be of 2mm thick. The structure shall be mounted on a rigid base frame of folded sheet steel of minimum 3mm thickness and 75mm height.

All cutouts and covers shall be provided with synthetic rubber gaskets (preferably neoprene).

The panel shall be divided into distinct vertical sections each comprising of:

- i) Complete enclosed bus bar compartment for running horizontal and vertical bus bars.
- ii) Complete enclosed switchgear compartment one for each circuit for housing air circuit breaker, MCCB/MPCB with starters etc.
- iii) Compartment for power and control cables of at least 300mm width covering entire height provided.
- iv) The panel shall have sufficient space at least 20% of outgoing feeders for future use.

The front of each compartment shall be provided with hinged single leaf door with locking facilities. Panel shall be provided with suitable lifting facilities. Isolators and MCCB/ACBs and accessories shall be of fixed/draw out type as per BOQ.

Each feeder shall have compartmentalized or non-compartmentalized for MCB feeders only. Ri-tall type with separate construction cable entry shall be from top/bottom (3mm thick gland plate with suitable numbers & sizes of knockout holes (as called for in schematic/ fabrication drawings) shall be provided.

The panel shall be provided with three phase buses & neutral bus bars of high conductivity electrolytic copper/Aluminium sections throughout the length of the panel & shall be adequately supported and braced to withstand the stressed due to the short circuit current of 25 KA rms. for 1 sec. as called for in BOQ/Data Sheet. Maximum temperature rise of bus bars and bus bar connection while carrying rated current shall not exceed 40 Deg.C over an ambient temperature of 50 Deg.C. The Current density of Bus Bar shall be 0.8 Amp/mm² for Aluminium and 1.25 Sq.mm/mm² for copper.

The minimum clearance in air between phases for the entire run of the bus bar connections shall be 32mm minimum and phase to Neutral/earth for the entire run of the bus bar connections shall be 26mm minimum. Bus bars support insulators shall be made of non-hydroscopic non-combustible track resistant and high strength SMC or polyester fiberglass moulded material.

All bus bars shall be colour coded as per IS: 375.

Copper/G.I./Aluminium earth bus of suitable size shall be provided at the bottom of the panel throughout the length. Similarly suitable size of strip in each vertical section for earthing the individual equipment/accessories shall be provided and connected to main horizontal bus.

Sheet steel hinged lockable doors shall be interlocked with MCCB to prevent opening of the panel when MCCB is on position. Safety interlock with operating handle shall be provided.

Contactors shall be electromagnetic type with interrupted duty as per IS: 2959. The main contacts shall be of silver or silver alloy, provided with minimum 2 NO and 2 NC auxiliary contacts. The push button should be of shrouded type and each should be provided with 1 NO and 1 NC contact. Colour coding shall be as per IS: 6875 (Part-II).

MOULDED CASE CIRCUIT BREAKER (MCCB)

MCCB shall conform to the latest IS13947-1993/IEC 60947. The Service Short Circuit Breaking Capacity (Ics at 415 VAC) should be as specified.

MCCB shall be Current Limiting and comprise of Quick Make – Quick Break switching mechanism & Double Break Contact system. The arc extinguishing device and the tripping unit contained in a compact, high strength, heat resistant, flame retardant, insulating molded case with high withstand capability against thermal and mechanical stresses. All MCCBs shall be capable of defined variable overload short circuit and earth fault adjustment with thermo- magnetic releases up to 250A and with electronic release above 250A onwards.

The Service Short Circuit Breaking Capacity (Ics at 415 VAC) should be as called for in BOQ and is the required minimum value for that feeders/ panel, however if the rating of feeder mentioned is not available, the contractor shall use next higher rating without any extra charges. The service short circuit breaking capacity shall be equal to ultimate breaking capacity of MCCB, i.e. $I_{cs} = 100\% I_{cu}$

The trip command shall over ride all other commands. MCCB shall employ maintenance free double break contact system to minimize the let thru' energies and capable of achieving discrimination up to the full short circuit capacity of downstream MCCB. The manufacturer shall provide both the discrimination tables and let thru' energy curves. The MCCB shall not be restricted to Line/Load connections.

The handle position shall give positive indication of 'ON', 'OFF' or 'Tripped' thus qualifying to disconnection as per the IS/IEC indicating the true position of all the contacts. In case of 4 pole MCCB the neutral shall be defined and capable of offering protection up to full rating. The remote tripping coil should be of continuous duty. The general-purpose control switch shall be provided for ON/OFF Auto/Manual. The switch shall be provided with engraving plates on the front with the complete inscription.

The switch shall be normally a fixed control box type heavy-duty unit.

Indicating lamps shall be of the panel mounting, LED type and shall have execution plates marked with its function wherever necessary. The color of the lamp cover shall be red for 'ON' and green for 'OFF' indicating lamps shall be provided with series resistor. MCCB shall be provided with interlocking device for interlocking the door of switchboard. Following shall be included if specified in the drawing or in the schedule of quantities:

- Under voltage trip
- Shunt trip
- Alarm Switch
- Auxiliary switch

PAINTING

All steel work shall be pretreated in tanks and finally powder coated of approved shade.

WIRING

Control and protective wiring shall be done with copper conductor PVC insulated 1100 volts grade multi-stranded flexible wire of 2.5sq.mm cross section. The colour coding shall be as per latest edition of IS: 375.

Each wire shall be identified by plastic ferrule. All wire termination shall be made with type connection. Wire shall not be taped or spliced between terminal points.



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Terminal blocks shall preferably be grouped according to circuit function and each terminal block group shall have at least 20% spare capacity.

Not more than one wire shall be connected to any terminal block. All doorframe of L.T. switchboard shall be earthed with bare braided copper wire.

SECTION – S.07 CABLE/WIRES

1 Wires

The design manufacture, testing and supply of single core **FRLS PVC** insulated 1.1 KV grade Copper conductor under this specification shall comply with latest edition of following standards.

- a IS: 3961 Current rating for cables.
- b IS: 5831 PVC insulation and sheath of electric cables.
- c IS: 694 PVC insulated cables for working voltage up to and including 1100 volts.
- d IEC: 754(i) FRLS PVC insulated cable.

Copper conductor FRLS PVC insulated wires shall be used in conduit as per item of work.

The wires shall be colour coded R Y B, for phases, Black for neutral and Green for earth.

Progressive automatic in line indelible, legible and sequential marking of the length of cable in metres at every one metre shall be provided on the outer sheath of wire.

The material & insulation of wires shall be **ROHS compliant** (Reduction of Hazardous Substance) and shall comply the following directives:

- EU Directive 2002/95/EC Issued Jan 2003
- EU Directive 94/62/EC and 2004/12/EC (amendment)
- EU Directive 91/338/EEC
- EU Directive 91/157/EEC & 98/101/EC (amendment)

2) Cables

The design, manufacture, testing and supply of the cable under this specification shall comply with latest edition of following standards:

- a IS: 8130 Conductors for insulated electric cables and flexible cords.
- b IS: 7098 XLPE insulation and sheath of electric cables.
- c IS: 3975 Mild steel wires, strips and tapes for armouring cables.
- d IS: 7098 Current rating of cables.
- e IS: 7098 XLPE insulated (heavy duty) electric cables for working voltage up to and including 1100 volts.
- f IS: 424-1475(F-3) Power cable-flammability test.

Specification for cross-linked polyethylene insulated XLPE sheathed cable for working voltage upto 1.1 KV.

Specification for XLPE insulated (heavy duty) electric cables for working voltages up to and including 1100 volts.

IEEE : 383 Standard for type of test Class-IE, Electric cables, field splicers and connections for power generation station.



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IS: 10418 Cable drums.

3 Perforated Cable tray – for Power Cables & Low current service both

The perforated cable trays are fabricated out of 1.6mm thick CRCA sheet steel having minimum 50mm depth or as called for in BOQ, hot dip galvanized or epoxy coated of approved shade. Perforations are maximum 10mm spaced at maximum 20mm distance. The cables shall be tied with the cable tray with nylon strip/ aluminium clamps/M.S. clamps as per requirements.

Suitable provision shall be made where a tray crosses expansion joints. The width of the tray shall allow for a suitable separation between cables the design shall allow for adequate bending radius for the sizes of cables. No sharp bend to be allowed in cable tray. Joints between sections shall be bolted.

The tray shall be suspended from the surface of the concrete slab by means of approved steel hangers spaced at a distance of not more than 125cms. Suitable bushes shall be provided where cables pass through apertures in the tray. Cables must be securely fixed to the tray with clamps or cable ties. In routing necessary barrier and spacing shall be maintained for cables of different voltages in case they lie side by side. Telephone cables shall cross the power cables only at about right angle and these two shall not run in close proximity. Full details of the tray shall be approved by the Engineer-in-charge before fabrication. Earth continuity shall be maintained between each section of cable tray and each total run of tray shall be effectively bonded to the nearest earth continuity conductor. All nuts and bolts used shall be of galvanised steel.

Depending on the size of cable trays space of 20-33% has to be maintained for future expansion. Cable tray is manufactured to comply with the specifications of National Electrical Code (NEC) and National Electrical Manufacturer's Association (NEMA).

ANNEXURE – A - LIST OF APPROVED MANUFACTURER'S/ MAKES

All materials and products shall conform to the relevant standard specification, IS codes and other relevant codes etc. and shall be of approved makes and design.

While quoting the Contractor shall verify applicability of the makes to the item of works and shall satisfy himself regarding the availability and delivery of the materials in time for the project.

MATERIAL	MANUFACTURER/ BRAND NAME
Cement	Ultratech, Lafarge, ACC, JK
Reinforcement Bars (Fe500 Physically & Chemically tested)	TISCO, JSW/ JSPL
MS Tubes	Tata, Jindal (Hissar), Nezone, SAIL, Utkarsh
MS Structural Steel	Tata, JSPL/ JRW, SAIL
Grouting Mortar/ Tile Joint Filler	Laticrete, Bal Adhesives & Grouts, Roff Rainbow Tile mate
Silicone Sealants	G.E. Bayer Silicone/ Dow Corning/ Wacker
Waterproofing Chemicals	BASF, FOSROC, Roffe, SIKA
Resin Bonded Glass Wool/ Mineral wool	UP Twiga, Lloyd Insulations, Crown Fibreglass
Welding Rods	Ador, Esab
Extruded Polystyrene foam Board	Styrofoam (Dow Chemicals), Insuboard (Supreme Petrochem)
Expansion/ Rebar/ Anchor, Plastic & Chemical Fasteners	Hilti, Fischer
Stainless Steel Screws, Bolts, Washers & Nuts	Corroshield, Hilti, Kundan/ Puja/ Atul
Paints	ICI Dulux, Berger
GI Pipes	Tata, Jindal (Hissar)
GI fittings	Unik, 'R'
uPVC Pipes & Fittings	Supreme, Kissan, Prince, Finolex, AKG
Hi Wall Units	Daikin/ Hitachi /Carrier
GI conduit and accessories	B.E.C/ AKG
PVC Conduit and Accessories	B.E.C / AKG / Polypack
Distribution Boards / MCB / ELCB	L&T/ABB/Schneider
Cable/wire	Finolex/Polycab/Havells/Rallison
Cable Tray	Slotco/ Steelways/MEM/ Profab
LT Panels	Adlec / Advavce / Tricolite
Cable Glands	Comet/ Stepwell
Lugs	Dowells Crimping Type

ANNEXURE – B - LIST OF APPLICABLE CODES & STANDARDS

Code No.	Description
General	
IS: 1322	Bitumen felts for water proofing and damp-proofing
IS: 6408 (Parts 1,2)	Recommendations for modular co-ordination in building industry – tolerances
BS: 5606	Guide to accuracy in building
SP 23 (S&T)	Hand Book on Concrete Mixes
Bitumen	
IS: 3384	Specification for bitumen primer for use in waterproofing and damp-proofing
Building Construction Practices	
IS: 11134	Code of Practice for setting out of buildings
Cement	
IS: 1489 (Part 1)	Portland pozzolana cement: Fly ash based
IS: 8112	Specification for 43 grade ordinary Portland cement.
IS: 12269	Specification for 53 grade ordinary Portland cement.
Concrete	
IS: 456	Code of practice for plain and reinforced concrete
IS: 460 (Parts I to III)	Specification for Test Sieves
IS: 516	Methods of test for strength of concrete
IS: 1199	Methods of sampling & analysis of concrete
IS: 1607	Method of Test Sieving
IS: 2386	Parts I-VIII Methods of tests for aggregates for concrete
IS: 2430	Methods of Sampling of Aggregates of Concrete
IS: 2571	Code of practice for laying in-situ cement concrete flooring
IS: 7969	Safety code for handling and storage of building materials
IS: 9103	Specifications for admixtures for concrete
IS: 10262	Recommended guidelines for concrete mix design.
Construction Plant and Machinery	
IS: 1791	Specification for batch type concrete mixers
IS: 2505	General requirements for concrete vibrators: Immersion type
IS: 3558	Code of Practice for use of immersion vibrators for consolidating concrete
IS: 4656	Specifications for form vibrators for concrete
Formwork	
IS: 4990	Specifications for plywood for concrete shuttering work
Handling and Storage	
IS: 4082	Recommendation of Stacking and Storage of construction materials
Instruments For Testing Concrete	
IS: 5513	Specification for Vicat apparatus

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Code No.	Description
IS: 5514	Specification for apparatus used in Le-Chaterlier test.
IS: 7320	Specification for concrete slump test apparatus
IS: 7325	Specification for apparatus to determine constituents of fresh concrete
IS: 10080	Specification for vibration machine
IS: 10086	Specification for moulds for use in tests of cement and concrete
IS: 10510	Specification for Vee-Bee Consistometer
Paints and Coatings	
IS: 102	Ready mixed paint, brushing, red lead, non-setting, priming
IS: 109	Ready mixed paint, brushing, priming, plaster, to Indian Standard Colour No. 361 and 631 white and off white
IS: 2074	Ready mixed paint, air drying, red oxide-zinc chrome, priming
Reinforcement & Structural Steel	
IS: 814	Parts I & II. Electrodes for metal arc welding of structural steel
IS: 815	Classification coding of covered electrodes for metal arc welding of structural steels
IS: 816	Code of Practice for use of metal arc welding for general construction in mild steel
IS: 2502	Code of Practice for bending and fixing of bars for concrete reinforcement.
IS: 5525	Recommendations for detailing of reinforcement in reinforced concrete works
IS: 226	Structural steel (Standard Quality)
IS: 800	Code of practice for use of structural steel in general building construction.
IS: 813	Scheme of symbols for welding.
IS: 814	Covered electrodes for metal arc welding of structural steel. (Part I & Part II)
IS: 816	Code of practice for use of metal arc welding for general construction in mild steel.
IS: 822	Code of practice for inspection of welds.
IS: 1182	Recommended practice for radiographic examination of fusion welded butt joints in steel plates.
IS: 5624	Specification for foundation bolts.
Sand	
IS: 383	Coarse and fine aggregates from natural sources for concrete.
Scaffolding	
IS: 2750	Specification for steel scaffoldings
IS: 3696 (Part 1)	Safety Code of scaffolds and ladders: Scaffolds
IS: 3696 (Part 2)	Safety Code of scaffolds and ladders: Ladders
IS: 4014 (Part 1)	Code of practice for steel tubular scaffolding: Definition and materials
IS: 4014 (Part 2)	Code of practice for steel tubular scaffolding: Safety regulations for scaffolding
OTHER PUBLICATIONS	
CPWD Specifications 2009 with up-to-date correction slips	
CPWD Delhi Schedule of Rates (DSR) –2012 with up-to-date correction slips	

PREAMBLE TO BILL OF QUANTITIES

1. The conditions of contract and the drawings shall be read in conjunction with the specifications and matters referred to, shown or described in one are not necessarily repeated in the other. These specifications are comprehensive but may exceed the requirements of this project. Any ambiguity between the General Specifications, the Bill of quantities and contract drawings, shall be referred to the COR for clarification before the date fixed for delivery of Tenders. Any ambiguity found after signing of the contract may be referred to the COR and COR shall give a ruling which shall prevail. No claim for additional cost due to above, however, will be entertained.
2. Notwithstanding the sub-division of the specification into various headings, every part of it is to be deemed supplementary to every other part and is to be read with it, so far as it may be practicable to do so, or when the context so admits.
3. Reference made to the International / Indian Standards or CPWD specification shall be deemed to include the latest editions or issue of standards, specifications or Bye-Laws including all revisions up to the date of invitation of Tenders. The Contractor shall keep at site copies of all (latest versions) relevant standards and codes of practice referred to in these specifications throughout the period of contract.
4. All items or materials shall be delivered to the site in the manufacturer's original unopened containers with the manufacturer's brand and name clearly marked thereon.
5. All items or materials shall be assembled, mixed, fixed, applied or otherwise incorporated in the works in accordance with the printed instructions of the manufacturer of the item or materials.
6. Date of construction to be written on all respective items for monitoring curing.
7. Contractor shall follow the pour card/ check list/ stage approval system for all works on prescribed formats.
8. Unless otherwise provided in the description of various items of the work, the rates tendered by the contractor shall be for complete items of work covering all materials, wastage, Taxes, carriage, royalties, fees, rents, labour, scaffolding, ladders, temporary support, tools, plant, equipment's, transport, electricity/ water, temporary constructions, supervision, overhead charges and profits as well as well as general liabilities, obligations and risk arising out of the conditions of contract and carrying the work in parts or under/ across/ along pipes, cables, trenches, drains etc. complete and shall apply to all heights, depths, leads and lifts. No extra charges whatsoever consequent of any misunderstanding or otherwise shall be allowed.
9. All items to be installed/ provided in position.
10. The quoted price for items shall include all accessories, consumables, spares etc. as required to make the item complete in all respects, compatible with other related/associated items and fully functional.
11. Loading, transporting, unloading, handling/ double handling, hoisting to all levels, setting, fitting and fixing in position, protecting, disposal of debris and other labour necessary in and for the full and entire execution and to fully complete the job in accordance with the contract documents, good practice and recognized principles shall be responsibility of the contractor.
12. The contractor shall periodically remove all surplus materials/ debris/ waste materials etc. and clean the areas while working and after completion.
13. Any damage caused to the existing and / or work in hand during execution of the work including that being done by other contractor's, shall be made good by the contractor at his own cost.
14. Any error in description of quantity or omission of items from this Schedule shall not vitiate this Contract but shall be the corrected and deemed to be a variation required by the COR.
15. The specification for items not covered in this specification schedule of quantity, specified standards and rules shall be followed as per IS Specifications/COR's instructions.